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| 09/453,831 | 12/02/1999 | KENRO NAKAMURA | 04329.2199 | 3119 |

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EXAMINER

UMEZ ERONINI, LYNETTE T

| | |
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| ART UNIT | PAPER NUMBER |
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1765

DATE MAILED: 05/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

33

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|------------------------------|-------------------------------------|---------------------------------|--|
| Office Action Summary | Application No. 09/453,831 | Applicant(s) NAKAMURA ET AL. | |
| | Examiner Lynette T. Umez-Eronini | Art Unit 1765 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11, 12 and 17-26 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 11, 12 and 17-26 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>15</u> . | 6) <input type="checkbox"/> Other: |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 24 and 26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claim 24, lines 1 and 2; and

In claim 26, lines 1 and 2, " wherein said solvent consists essentially of water" is not supported by the Specification. "A consisting essentially of" claim occupies a middle ground between closed claims that are written in a consisting of' format and fully open claims that are drafted in a comprising' format." PPG Industries v. Guardian Industries, 156 F.3d 1351, 1354, 48 USPQ2d 1351, 1353-54 (Fed. Cir. 1998). When an applicant contends that additional steps or materials in the prior art are excluded by the recitation of "consisting essentially of," applicant has the burden of showing that the introduction of additional steps or components would materially change the characteristics of applicant's invention.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 11 and 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Westmoreland (US 6,143,192) in view of Danielson et al. (US 5,407,526).

Westmoreland teaches, a planarizing (polishing) method that comprises:

As pertaining to **claims 11 and 17-21**, Westmoreland teaches, "... removing ruthenium metal and/or ruthenium dioxide includes an amount of ceric ammonium nitrate. The material of the invention may be, for example, a solution of ceric ammonium nitrate. The material may be in the form of a liquid etchant solution, and, in one form, the solution may be an aqueous solution wherein ceric ammonium nitrate and, optionally, other solutes, are dissolved in liquid water" (column 3, line 42-49). Westmoreland also teaches, "In one form, the material of the invention may include about 0.5 to about 70 weight percent of ceric ammonium nitrate (column 3, lines 55-57), which provides evidence that the concentration of material comprising ceric ammonium nitrate is variable and is diluted. Hence the aforementioned reads on,

A polishing method comprising:

preparing a first polishing liquid containing tetravalent cerium ions or cerium (IV) nitrate in a first concentration (wherein the ceric ammonium nitrate is the same as applicant's first polishing liquid);

adding a solvent for dilution to said first polishing liquid to form a second polishing liquid containing tetravalent cerium ions in a second concentration lower than the first concentration; and

wherein said solvent has a property of dissolving a solute of said first polishing liquid and does not substantially contain any solute, as **in claim 23**.

Westmoreland also teaches, "The ceric ammonium nitrate material . . . may be used as an active chemical component of a slurry used in a planarization process for planarizing a surface. In such an application, the material . . . is applied to the surface and acts to remove ruthenium metal and/or ruthenium dioxide from the surface that is planarized. The planarization process may be a chemical mechanical planarization process, . . ." (column 5, line 10-20), which reads on,

polishing a surface of a substrate containing Ru or a Ru compound in a surface region with the second polishing liquid.

Westmoreland differs in failing to explicitly teach the addition of the solvent is carried out upon or immediately before the polishing of said substrate, **in claim 17**.

Danielson teaches, "An abrasive solution and a oxidant solution are stored separately in containers, pumped into a mixing chamber where they are mixed so as to form a slurry, and the slurry is then immediately used to polish/etch a semiconductor device" (Abstract). Since Danielson teaches a method of preparing an abrasive solution (polishing liquid), mixing the abrasive solution with an oxidant (same as diluting the initial polishing liquid) to form a slurry (a second polishing liquid), and using the slurry immediately to polish/etch a semiconductor device, then using Danielson's polishing

method would read on applicant's step of wherein said addition of the solvent is carried out upon or immediately before the polishing of said substrate, as in the claimed invention.

Hence, it is the examiner's position it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Westmoreland by using Danielson's method wherein said adding a solvent is carried out upon or immediately before the polishing of said substrate for the purpose of creating of slurries which give superior polish/etch rate (Danielson, column 2, lines 7-10).

4. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Westmoreland (US '192) in view of Danielson ('526) as applied to claim 17, and further in view of Takikawa et al. (US 4,574,292).

Westmoreland in view of Danielson differs in failing to teach the Ru compound is SrRuO_3 .

Takikawa teaches, "The atomic ratio M/Ru of Ru and the metal M in the metal oxide film containing Ru and a metal M . . . provides a very stable structure of . . . RuSrO_3 " (column 2, lines 39-45), which reads on a Ru compound is SrRuO_3 .

Hence, it is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Westmoreland in view Danielson by using a Ru compound such as SrRuO_3 as taught by or Takikawa for the purpose of providing a stable structure (Takikawa, column 2, lines 43-45).

5. Claims 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Westmoreland ('192) in view of Danielson et al. ('526).

Westmoreland teaches, "... removing ruthenium metal and/or ruthenium dioxide includes an amount of ceric ammonium nitrate. The material of the invention may be, for example, a solution of ceric ammonium nitrate. The material may be in the form of a liquid etchant solution, and, in one form, the solution may be an aqueous solution wherein ceric ammonium nitrate and, optionally, other solutes, are dissolved in liquid water" (column 3, line 42-49). Westmoreland also teaches, "In one form, the material of the invention may include about 0.5 to about 70 weight percent of ceric ammonium nitrate (column 3, lines 55-57), which provides evidence that the concentration of material comprising ceric ammonium nitrate is variable and is diluted. Hence the aforementioned reads on,

A polishing method comprising:

preparing a first polishing liquid containing tetravalent cerium ions or cerium (IV) nitrate in a first concentration (wherein the ceric ammonium nitrate is the same as applicant's first polishing liquid);

adding a solvent for dilution to said first polishing liquid to form a second polishing liquid containing tetravalent cerium ions in a second concentration lower than the first concentration; and

wherein said solvent has a property of dissolving a solute of said first polishing liquid and does not substantially contain any solute, as in claim 25.

Westmoreland also teaches, "The ceric ammonium nitrate material . . . may be used as an active chemical component of a slurry used in a planarization process for planarizing a surface. In such an application, the material . . . is applied to the surface and acts to remove ruthenium metal and/or ruthenium dioxide from the surface that is planarized. The planarization process may be a chemical mechanical planarization process, . . ." (column 5, line 10-20), which reads on,

polishing a surface of a substrate containing Ru or a Ru compound in a surface region with the second polishing liquid.

Westmoreland differs in failing to explicitly teach the adding of the solvent is carried out upon or immediately before the polishing of said substrate.

Danielson teaches, "An abrasive solution and a oxidant solution are stored separately in containers, pumped into a mixing chamber where they are mixed so as to form a slurry, and the slurry is then immediately used to polish/etch a semiconductor device" (Abstract). Since Danielson teaches a method of preparing an abrasive solution (polishing liquid), mixing the abrasive solution with an oxidant (same as diluting the initial polishing liquid) to form a slurry (a second polishing liquid), and using the slurry immediately to polish/etch a semiconductor device, then using Danielson's polishing method reads on applicant's step of wherein said addition of the solvent is carried out upon or immediately before the polishing of said substrate, as in the claimed invention.

Hence, it is the examiner's position it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Westmoreland by using Danielson's method wherein said adding a solvent is carried out upon or

immediately before the polishing of said substrate for the purpose of creating of slurries which give superior polish/etch rate (Danielson, column 2, lines 7-10).

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers

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for the organization where this application or proceeding is assigned are 703-972-9310
for regular communications and 703-972-9311 for After Final communications.

ltue
May 17, 2003

Ben L. Utech
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